

**CITY OF CORONA
PUBLIC WORKS DEPARTMENT**

TRAFFIC IMPACT STUDY GUIDELINES



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TRAFFIC IMPACT STUDY (TIS) GUIDELINES

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1. INTRODUCTION

The purpose of Traffic Impact Study (TIS) Guidelines is to provide a general guide in assessing the potential traffic impacts of any proposed development projects, General Plan Amendments, and changes in zoning in the City of Corona. This TIS guide presents the required format (See Exhibit E) and methodology that is generally required to be utilized in the study preparation.

The TIS must be prepared by a registered traffic engineer (State of California).

The TIS must contain a Title page that includes, at a minimum, the Tract or Parcel number of the project, the developer's name and address and the Traffic Engineer's name, address, phone number and stamp.

To avoid unnecessary delays or revisions and to streamline the TIS preparation and review process, the applicant shall submit a "Traffic Impact Study Scope" (See Exhibit F) prior to the preparation and submittal of a draft TIS.

2. NEED FOR TRAFFIC STUDY

The requirement for a TIS will be based upon, but not limited to, the following criteria:

- a) If a project generates 1 to 49 trips during any peak hour without consideration of pass-by trips to the existing circulation system, a focused site TIS is required for the proposed project.
- b) If a project generates 50 peak hour trips or more without consideration of pass-by trips, a full TIS is required for the proposed project.
- c) If a project is located near a major arterial or impacted intersection.
- d) As directed by the City Traffic Engineer.

3. SCOPE OF TRAFFIC IMPACT STUDY

3.1 Study Area Boundaries

The area to be studied shall include at a minimum any key intersection of "collector" to "collector" or higher classification streets, on which the proposed project will add 50 or more peak hour trips from the project site. All key intersections and roadway segments within this study area must be analyzed to identify impacts to capacity and LOS. The study intersections and roadway segments shall be listed in the "Traffic Impact Study Scope" (See Exhibit F) for review and approval by the City Traffic Engineer.

Following intersections and roadway segments shall be studied:

- a) Site access driveways
- b) Roadway adjacent to the project
- c) Intersections in the immediate vicinity of the project
- d) Any intersection of “Collector” or higher classification street with “Collector” or higher classification streets, on which the project will add 50 or more peak hour project trips
- e) Roadway links between study intersections and/or project driveways.

Focused Site TIS shall study items a), b), and c) only.

3.2 Study Scenarios

The following study scenarios shall be included for roadway and intersection capacity analysis:

- a) Existing Conditions
- b) Project Opening Year with Background Traffic
- c) Project Opening Year with Background Traffic and Proposed Project
- d) Project Opening Year with Background Traffic and Proposed Project plus Mitigation
- e) Build-out Year with Background Traffic
- f) Build-out Year with Background Traffic and Proposed Project
- g) Build-out Year with Background Traffic and Proposed Project plus Mitigation

Focused Site TIS shall study items a), b), c) and d) only.

3.3 Study Periods

In accordance with the City’s General Plan, the TIS shall include the following commute peak periods:

- a) Morning (6:30 a.m. to 9 a.m.)
- b) Afternoon/evening (4 p.m. to 6 p.m.)
- c) Midday and “School-Release” peak hours – As directed by the City
- d) Other peak hours, off-peak, weekend or special event, may also be required as directed by the City Traffic Engineer.

4. TRAFFIC DATA

4.1 Traffic Counts

Data for existing traffic conditions shall be collected for the project using the following guidelines:

- a) Peak period turning movement counts at all study intersections and driveways
- b) Average Daily Traffic (ADT) for all roadways within study area.
- c) Traffic counts shall not be used if more than one (1) year old.
- d) Traffic data shall not be collected on weeks that include a holiday and non-school session time periods.

- e) Traffic data shall not be collected between Thanksgiving and the first week of the new year without prior City approval.
- f) Traffic counts shall be conducted on Tuesdays, Wednesdays, or Thursdays.

Count data shall be included in the study appendices.

4.2 Trip Generation

The latest edition of the Institute of Transportation Engineers' (ITE) Trip Generation shall be used for trip generation forecasts unless otherwise directed by the City.

In accordance with the City's General Plan, all truck trips from industrial, warehouse and some retail commercial site shall be converted into passenger car equivalents (PCE) for the capacity analysis. The proposed trip generation shall be listed in the "Traffic Impact Study Scope" for review and approval by the City Traffic Engineer

4.3 Trip Distribution

For projects that generate greater than 200 gross peak hour trips, a select-zone analysis shall be performed to determine the trip distribution pattern utilizing the City's Traffic Forecast Model.

The trip distribution may be further refined, after consultation with the City Traffic Engineer, based on consideration of following factors:

- a) Type of proposed development
- b) Location and intensity of development
- c) Conditions on the roadway network in the vicinity
- d) Similar land use in the vicinity
- e) Truck route system
- f) As directed by City Traffic Engineer

Projects that generate less than 200 gross peak hour trips shall submit a manual project trip distribution pattern in the "Traffic Impact Study Scope" for review and approval by the City Traffic Engineer.

4.4 Trip Forecasts

If project is expected to generate over 200 gross peak hour trips, the City's Traffic Forecast Model shall be updated using trip data from this and all approved developments within the traffic study area. The list of all approved developments shall be obtained from the planning department. Build-out Year traffic volumes shall be derived from the updated model.

Project Opening Year base traffic volumes shall be derived from interpolating straight line growth rate between the existing and Build-out Year traffic volumes from the City's updated Traffic Forecast Model.

If the proposed project is projected to generate fewer than 200 gross peak hour trips, the future project opening year base traffic volumes shall be estimated using an annual growth factor of two (2) percent per year or as directed by the City Traffic Engineer. Build-out Year traffic volumes shall be derived from the City's latest Traffic Forecast Model.

5. TRAFFIC ANALYSIS METHODOLOGY

5.1 Intersection Analysis

In accordance with the City's General Plan, intersection analysis shall be performed using the Transportation Research Board, Highway Capacity Manual (HCM) 2000 methodology.

- a) Signalized intersection shall be analyzed using the Operation Method as described in Chapter 16, Section II of Highway Capacity Manual (HCM).
- b) Unsignalized intersection shall be analyzed using the methodology in Chapter 17 of HCM.

5.2 Roadway Link Analysis

The roadway link analysis, when required, is to be performed by comparing the Average Daily Traffic (ADT) projected for a segment with the maximum allowed under "Estimated 24 hour Traffic (ADT)" of the "City of Corona Street Design Table" shown on Exhibit B for that street classification.

In accordance with the City's General Plan, Riverside County Roadways located within the City's Sphere of Influence shall be maintained at LOS C or better per the "Riverside County Level of Service Criteria" shown on Exhibit C.

5.3 Level of Service (LOS) Criteria

In accordance with the City's General Plan, the following intersection level of service (LOS) thresholds from the General Plan shall be implemented using the current Highway Capacity Manual (HCM):

- a) **LOS C** or better shall be maintained for local intersections in residential/industrial areas.
- b) **LOS D** or better shall be maintained on collector and arterial intersections.
- c) **LOS E** will be permitted for the following intersections:
 - Lincoln Avenue at SR-91
 - Main Street at SR-91
 - McKinley Avenue at SR-91
 - Hidden Valley Parkway at I-15
 - Cajalco Road at I-15
 - Weirick Road at I-15
 - Other locations as approved by the City Engineer

See Exhibit A for LOS definitions and LOS concept.

5.4 Traffic Signal Warrant Analysis

A traffic signal warrant analysis shall be performed for all studied unsignalized intersections for the project opening year. Those intersections that do not meet warrants for opening year and are not master planned signal locations shall be reanalyzed using build-out year data.

Traffic signal warrant analysis shall be performed using the latest adopted California MUTCD. The warrant analysis shall be included in the study appendices.

In determining the location of a new traffic signal on an arterial street or approaching an arterial street, traffic progression and simulation analysis may be required using SYNCHRO software at the direction of the City Traffic Engineer.

5.5 Site Access Analysis

In accordance with the City's General Plan, following access analysis shall be performed to improve the project access circulation and to limit driveways and local street access on arterial streets:

- a) **Intersection Sight Distance** – All on-site intersections, project access driveways or streets to public roadways shall provide adequate sight distance. Adequate intersection sight distance shall be determined using the City of Corona, Public Works Department, Standard Plan 100-H.
- b) **Driveway Length and Gated Entrance** - Primary project driveways shall be of sufficient length to allow vehicles to enter the project area without causing subsequent vehicles to back out onto the City street system. See Exhibit D for driveway length requirements. The private street gated entrance shall be designed using the City of Corona, Public Works Department, Standard Plan 100-J.
- c) **Distances between driveways** – In accordance with the City's General Plan, driveways and local streets access on arterial streets shall be limited to minimize the impacts on arterial streets. Whenever possible, driveways shall be consolidated with adjacent properties. See City of Corona, Public Works Department, Standard Plan 101-2 for the driveway spacing guidelines.
- d) **Corner Clearance** – A driveway should be a sufficient distance from a signalized intersection so that right-turn egress movements do not interfere with the right-turn queue at the intersection. In addition, right-turn egress movements should have sufficient distance to enter the left-turn pocket at the adjacent intersection. See City of Corona, Public Works Department, Standard Plan 101-2 for the corner clearance guidelines.
- e) **Right turn lanes at driveways** – If the project right turn peak hour volume is 50 or more vehicles, a right-turn deceleration lane shall be reviewed for appropriateness on all driveways accessing major arterial and secondary streets. The length of right turn lane should be sufficient to allow a vehicle traveling at the posted speed to decelerate before entering the driveway as outlined in the Caltrans Highway Capacity Manual.

5.6 Safety and Operation Improvement Analysis

The TIS shall analyze existing roadway conditions to determine if safety and/or operational improvements are necessary due to an increase in traffic from the project or cumulative projects. The following improvements shall be analyzed:

- a) Addition of through lane(s), right turn lane(s), and left turn lane(s)
- b) Left and/or Right Turn lane pocket length (queue length)
- c) Bus turnouts – Coordinate potential bus stop locations, on arterial streets adjacent to the proposed project site, with Riverside Transit Agency (RTA) and Corona Cruiser transit services. Provide bus turnouts for each of the identified bus stop locations per the RTA's Design Guidelines for Bus Transit.
- d) Parking restrictions on adjacent streets
- e) Need for Free right turn lane – Free right turn lane shall be considered when right turn volumes exceed 300 vehicles per hour, and when the intersection LOS analysis will result in unacceptable levels of service.
- f) Traffic Signal Simulation and Coordination – For the new or modified traffic signals, the City Traffic Engineer may require traffic simulation and coordination timing plans using the latest Synchro software. The traffic simulation and coordination timing plan shall include signalized intersections as identified by the City Traffic Engineer. A copy of the Synchro file shall be made available to the City for review.
- g) Bike Circulation – Identify and implement bike lane facilities adjacent to the project site in accordance with the City's Bicycle Master Plan.

6. DETERMINATION OF IMPACTS

In accordance with the City's General Plan, at locations where intersection LOS falls below, or is anticipated to fall below, an acceptable threshold per section 5.1 of this document in the future, feasible measures must be identified to mitigate the impacts.

- a) **Existing Condition** – Deficiencies should be identified.
- b) **Project Opening Year with Background Traffic Plus Project** –
 1. If a project causes a facility that is projected to operate at an acceptable LOS with opening year background traffic, to operate at an unacceptable LOS, then mitigation measures shall be identified for which the project shall be responsible to bring the facility back to an acceptable LOS.
 2. In addition, developments that require a change in zoning from that shown in the current General Plan shall be responsible for mitigating impacts caused to City facilities by the zoning change back to an acceptable LOS.
 3. If a project causes an impact to a facility operating at an unacceptable LOS with background traffic, then a mitigation measure shall be identified for which the project should pay a "fair share" as outlined in Section 7.

c) Build-out Year with Background Traffic Plus Project –

1. For impacts to non-master planned facilities, an analysis similar to that outlined in Section 6(b) shall be performed.
2. In addition, developments that intensify land use (i.e. General Plan Amendments) shall be responsible for mitigating impacts caused to City facilities by the zoning change back to an acceptable LOS as defined in Section 5.1.
3. All deficiencies within the scope of the study are to be identified. Mitigation measures and 'fair share' contributions (See Section 7) by the project for such mitigations shall be presented.

d) Site Specific Issues

- For City facilities contiguous to the project and major intersections in close proximity to the project, an analysis similar to that outlined in Section 2(b) shall be performed.
- Ingress/egress points and internal circulation of the project are to be reviewed for operational functionality.

7. PROJECT FAIR SHARE

The percentage of fair share for the project shall be calculated at each location as the ratio of the increase in delay from project trips divided by the difference between total delay (including project) and delay at acceptable Level of Service as defined in Section 5.1.

P = Project Fair Share (in percent)

D(p) = Project only delay increase (seconds/vehicle) of the intersection (or ADT for links) during the critical peak hour.

D(t) = Total delay of the intersection (or ADT for links) during the critical peak hour including that generated by the project.

D(a) = Total delay of the intersection (or ADT for links) during the critical peak hour under acceptable LOS condition as defined in Section 5.1 per the Highway Capacity Manual.

$$P = [D(p) / (D(t) - D(a))] * 100$$

Fair share cost of mitigation shall be calculated using the Project Fair Share percentage (P) multiplied by total estimated cost of mitigation.

For non-master planned facilities where there is no reasonable expectation that future development will significantly impact the facility, the project will be responsible for 100% of the mitigation cost and 'fair share' will not apply.

Exhibit A

Table 3.1-3 Intersection Level of Service Definitions

LOS	Interpretation	Signalized Intersection Delay (seconds per vehicle)	Stop-Controlled Intersection Average Stop Delay (seconds)
A	Excellent operation. All approaches to the intersection appear quite open, turning movements are easily made, and nearly all drivers find freedom of operation.	≤10	≤10
B	Very good operation. Many drivers begin to feel somewhat restricted within platoons of vehicles. This represents stable flow. An approach to an intersection may occasionally be fully utilized and traffic queues start to form.	>10 and ≤20	>10 and ≤15
C	Good operation. Occasionally backups may develop behind turning vehicles. Most drivers feel somewhat restricted.	>20 and ≤35	>15 and ≤25
D	Fair operation. There are no long-standing traffic queues. This level is typically associated with design practice for peak periods.	>35 and ≤55	>25 and ≤35
E	Poor operation. Some long-standing vehicular queues develop on critical approaches.	>55 and ≤80	>35 and ≤50
F	Forced flow. Represents jammed conditions. Backups from locations downstream or on the cross street may restrict or prevent movements of vehicles out of the intersection approach lanes; therefore, volumes carried are not predictable. Potential for stop-and-go-type traffic flow.	>80	>50

Source: Highway Capacity Manual 2000, Exhibit 16-2, and Exhibit 17-2

Source: City of Corona General Plan Technical Background Report, Page 3-7

Exhibit B

Exhibit C

Table 3.1-6 Riverside County Level of Service Criteria

Roadway Classification	Number of Lanes	Maximum Two-Way Traffic Volume (ADT) ¹		
		Service Level C	Service Level D	Service Level E
Collector	2	10,400	11,700	13,000
Secondary	4	20,700	23,300	25,900
Major	4	27,300	30,700	34,100
Arterial ²	2	14,400	16,200	18,000
Arterial	4	28,700	32,300	35,900
Mountain Arterial ²	2	12,900	14,500	16,100
Mountain Arterial	3	16,700	18,800	20,900
Mountain Arterial	4	29,800	33,500	37,200
Urban Arterial	4	28,700	32,300	35,900
Urban Arterial	6	43,100	48,500	53,900
Urban Arterial	8	57,400	64,600	71,800
Expressway	4	32,700	36,800	40,900
Expressway	6	49,000	55,200	61,300
Expressway	8	65,400	73,500	81,700
Freeway	4	61,200	68,900	76,500
Freeway	6	94,000	105,800	117,500
Freeway	8	128,400	144,500	160,500
Freeway	10	160,500	180,500	200,600
Ramp ³	1	16,000	18,000	20,000

All capacity figures are based on optimum conditions and are intended as guidelines for planning purposes only.

1. Maximum two-way ADT values are based on the 1999 Modified Highway Capacity Manual Level of Service Tables as defined in the Riverside County Congestion Management Program.
2. Two-lane roadways designated as future arterials that conform to arterial design standards for vertical and horizontal alignment are analyzed as arterials.
3. Ramp capacity is given as a one-way traffic volume.

Source: City of Corona General Plan Technical Background Report, Page 3-27

Exhibit D

Driveway Lengths

Peak Hour Entering or Existing Direction Volumes Per Lane	Unsignalized Minimum Driveway Length (FT)	Signalized Minimum Driveway Length (FT)
0-25	25	75
26-50	50	100
51-75	75	125
76-100	100	150
101-125	125	175
126-150	150	200
150-175	175	225
176-200	200	250
200>	25 additional feet of storage for each additional 25 <u>peak hour vehicles</u>	

Source: ITE Guidelines for Urban Major Street Design

Exhibit E

TRAFFIC IMPACT STUDY (TIS) FORMAT **City of Corona**

1. Executive Summary

2. Introduction

- a) Purpose of the TIS and study objective
- b) Project location and vicinity map (Exhibit 1)
- c) Project size, description, City case number, etc
- d) Existing and Proposed land use and zoning
- e) Site plan and proposed project (Exhibit 2)
- f) Proposed project opening year and phased opening
- g) Committed roadway improvements

3. Existing Condition

- a) Existing roadway network
- b) Existing traffic control and intersection geometrics (Exhibit 3)
- c) Existing traffic volumes – AM and PM peak hour and ADT (Exhibit 4A – AM and Exhibit 4B- PM)
- d) Existing Level of Service (LOS) at intersections and roadway links

4. Future Condition

- a) Project Traffic (Opening Year and Build out Year)
 - Trip generation
 - Trip distribution and assignment (Exhibit 5)
 - Project peak hour turning movement and ADT (Exhibit 6)
- b) Background Traffic (Opening Year and Build out Year)
 - Identify location and previously approved development projects (Exhibit 7)
 - Trip generation, distribution and assignment (Exhibit 8)
 - Background traffic growth rate
 - Total Background peak hour turning movement and ADT (Exhibit 9)
- c) Total Traffic (Opening Year and Build out Year)
 - Project plus Background Traffic peak hour turning movement and ADT (Exhibit 10)

5. Traffic Analysis

- a) Analysis Methodology (HCM, LOS D)
- b) Level of Service for Background Traffic
- c) Level of Service for Project and Background Traffic
- d) Level of Service for Project and Background Traffic with Mitigation

6. Traffic Impacts

- a) Determination of significant impacts
- b) Intersections and roadway links
- c) Site Access Analysis (See section 5.4)
- d) Safety and Operation Improvement Analysis (See section 5.6)

7. Mitigations and Recommendations

- a) Proposed mitigation measures to achieve LOS at impacted intersections
- b) Traffic Signal Warrant Analysis
- c) Recommended Improvements
 - On-site
 - Roadway improvements
 - Traffic control
 - Transit facility
 - Parking facility
 - Bicycle and Pedestrian facility
- d) Project Fair Share (See section 7)

Exhibit F

Traffic Impact Study Scope – City of Corona

Project Name:	
Project Address:	
Project Description:	
Case Number:	

	Consultant	Developer
Name:		
Address:		
Telephone: E-mail:		

A. Trip Generation

Proposed Land Use		Previous Land Use	
Existing Zoning		Proposed Zoning	

	In	Out	Total
AM Peak Hour			
PM Peak Hour			

B. Trip Distribution

Attach graphical representation

C. Background Traffic

Project Opening year:		Growth Rate:	
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D. Study Intersections

E. Specific Issues to be addressed in the Study

Approved By:

City of Corona Traffic Engineering:	
Date:	